UNIVERSITY OF PÉCS
Rector's Cabinet
International Centre

Computer Science

Study Abroad Course List

Tuition fee: 2600 / 2900 USD

For course syllabi, please contact the Study Abroad Office!

Course title	Semester	Credits (ECTS)
Calculus II.	Spring	8
Numerical Methods I.	Spring	8
Discrete Mathematics II.	Spring	8
Programming II.	Spring	8
Algorithms and Data Structures	Spring	8
Methodology of Programming I.	Spring	8
Professional Communication	Spring	8
Operating Systems	Spring	8
Computer Networks	Spring	8
Information and Data Security	Spring	8
Operation of IT Systems	Spring	8
Control Technology	Spring	8

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Calculus II.

	Semester:	Spring
	Form of teaching:	Lecture and Practice
Course leader: Dr. Pap Margit	Class hours per week:	1+2
Course requirement: Final exam	Credits (ECTS):	8
Language of instruction:	English	
Course description:	Week 1: Revision: derivation. Theorems of Mean: Rolle's theorem, Lagrange's theorem, Taylor's formula. Week 2: Applications of derivation: monotonicity, critical points, concavity, convexity, inflection point. Week 3: Function representation. L'Hospital rule. Week 4: Archimedes' method for determining the area of a plane under a parabola. Definition of integrability. Week 5: Properties of the definite integral. The integral function and its properties. Primitive function (indefinite integral). Operations on primitive functions. Week 6: Functions with primitive function. Relation between definite and indefinite integral: Newton-Leibniz formula. Week 7: Basic methods of indefinite integration: partial integration, integration by substitution. Week 8: Basic methods of indefinite integration: integration of rational functions, integration of trigonometric functions, integration of rational terms. Week 9: Basic methods of indefinite integration: integration of irrational functions. Applications of definite integral: area of a plane, length of an arc of curve, volume. 10. hét: Convergence of the improper integrals. Examples. Week 11:Differential equations with separable variables and first-order differential equations. First and second order linear differential equations.	

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	Week 12: Point sequences in R^2-space. Limit and continuity of two-variable functions. Differentiability of two-variable functions. Week 13: Extreme value problems of two-variable functions. Conditional extreme value.
Assessment methods:	Week 7: 1. Writing a test on the exercises and theoretical quaestions from the first part. Week 13: 2. Writing a test on the exercises and theoretical quaestions fro secand part. The grade will be based on the average of two 50-50 point exersise part written during the semester -- a maximum 100 points in total -- and the written theoretical part two 50-50 points, also a maximum 100 points in total points: 0%-33% unsatisfactory (1) 34%-49% satisfactory (2) 50%-65% moderate (3) 66%-81% good (4) 82%-100% excellent (5).

Numerical Methods I.

	Semester:	Spring
	Form of teaching:	Lecture and Practice
Course leader: Dr. Király Balázs	Class hours per week:	2+2
Course requirement: Practical grade	Credits (ECTS):	8
Language of instruction:	English	
Course description:	Week 1 Machine numbers, errors in computation Week 2 Direct solution of linear systems (Gaussian elimination, LU-factorisation and its applications, QR-factorisation and its applications) Week 3 Vector and matrix norms Week 4 Iterative solution of linear systems (Fix point iteration, Jacobi iteration, Gauss-Seidel iteration, Richardson iteration)	

	Week 5 Solution of nonlinear equations (Method of bisection, Fix point iteration, Newton-Raphson method, secant method, roots of polynomials) Week 6 Polynomial interpolation (Lagrange interpolation, Newton interpolation) Week 7 Hermite interpolation, Inverse interpolation Week 8 Spline interpolation Week 9 Approximation in Hilbert spaces Week 10 Generalized inverse of a matrix and the generalized solution of a linear system Week 11 Least square method Week 12 Numerical integration Classical quadratures, Newton-Cotes formulae Week 13 Chebyshev quadratures, Gaussian quadratures
Assessment methods:	From the lecture part: 7 Moodle tests (each of them with 4 questions). For the signature 13 points has to be collected (from the 28 points) From the practice part Two midterm tests will be written. Grades: 0–33% fail 33,1–50% pass 50,1–65% satisfactory 65,1–82% good 82,1–100% excellent

Discrete Mathematics II

	Semester:	Spring
	Form of teaching:	Lecture and Practice
Course leader: Dr. Jenei Sándor	Class hours per week:	2+2
Course requirement: Final exam	Credits (ECTS):	8
Language of instruction:	English	
Course description:	1. Divisibility and modular arithmetic 2. Representations of integers in different bases 3. Primes, trial division, sieve of Eratosthenes 4. Greatest common divisor and least common multiple, Euclidean algorithm 5. Solving congruences, linear congruences, the Chinese remainder theorem 6. Fermat's little theorem, pseudoprimes 7. Arithmetic functions, divisor functions, Euler's theorem 8. Graphs and graph models, directed and undirected graphs 9. Graph terminology and special types of graphs 10. Representing graphs, adjacency matrices, incidence matrices 11. Euler paths and circuits, Hamilton paths 12. Planar graphs, Euler's formula, Kuratowski's theorem 13. Trees, rooted trees, properties of trees, applications	
Assessment methods:	Each student will receive one final grade. There are two written midterm exams with grades x and y, and a final written exam with grade z. The final grade is (x+y+2z)/4. From 41% it is grade 2, from 56% garde 3, from 71% grade 4, and from 86% grade 5.	

Programming II.

	Semester:	Spring
Course leader: Dr. Gimesi László	Form of teaching:	Practice
Course requirement: Practical grade	Class hours per week:	0+4
Credits (ECTS):	8	
Language of instruction:	English	
Course description:	Week 1: Introduction, Install JDK and IDE (Apache NetBeans) Week 2: Data types, Variables, Operators	

	Week 3: Arrays, Wrapper classes Week 4: Control flows, Loops Week 5: Collections, Methods Week 6: Modifiers, Classes Week 7: Constructors, Encapsulation Week 8: Inheritence, Polymorphism Week 9: Midterm Week 10: Abstraction, Enums Week 11: Exception handling Week 12: File handling Week 13: Swing Framework
Assessment methods:	Class assignments: 25% Midterm exam: 25% Final exam: 50%

Algorithms and Data Structures

	Semester:	Spring
Course leader: Dr. Jenei Sándor	Form of teaching:	Lecture
Course requirement: Final exam	Class hours per week:	4+0
Credits (ECTS):	8	
Language of instruction:	English	
Course description:	The concept of algorithms, their specification and implementation The efficiency of algorithms, and the mathematical means of characterizing them. The concept of types: simple, compound, finite, non-finite and scalar types.. Collection types. Linear data structures adatszerkezetek: tömb, verem és listaszerkezetek és műveleteik. Searching. Binary trees, hash tables and BTrees. Sorting (mergesort, insertion and quicksort). Heap data type and its operations. Heapsort and priority queues. The concept of graphs and their representation. Basic graph algorithms. Breadth-first and depth-first traversal of graphs Properties of traversal algorithms. Topological ordering. Strongly	

	connected components and cliques. Shortest paths in weighted graphs. Dijkstra’s and Bellman-Ford’s algorithm Disjoint sets. Eager algorithms. Optimally weighted spawning trees.. Prim’s and Kruskal’s algorithm.. Dynamic programming and its application for the optimization of chained-multiplication in matrices.
Assessment methods:	Oral exam

Methodology of Programming I.

	Semester:	Spring
Course leader: Dr. Zentai Norbert	Form of teaching:	Lecture and Practice
Course requirement: Practical grade	Class hours per week:	2+2
Credits (ECTS):	8	
Language of instruction:	English	
Course description:	Week 1: Introduction, Set up development environment (JDK and Apache NetBeans) Week 2: Programming languages categories, Paradigms, Variables, Data types Week 3: Operators, Wrapper classes Week 4: Arrays, Control flows, Loops Week 5: Methods, Collections Week 6: Object oriented programming basics, Classes, Modifiers Week 7: Constructors, Encapsulation, Inheritance Week 8: Abstraction, Polymorphism, Enums Week 9: Exception handling Week 10: Basic I/O Week 11: XML Processing Week 12: Generics Week 13: Swing framework	
Assessment methods:	Homework: 25% Final Examination (written theory and practice): 75%	

Professional Communication

	Semester:	Spring
Course leader: Dr. Zentai Norbert	Form of teaching:	Lecture
Course requirement: Final exam	Class hours per week:	2+0
Credits (ECTS):	8	
Language of instruction:	English	
Course description:	Main focuspoints of the course: 1. Sources of scientific and technical information. Books, journals, periodicals, ISBN, ISSN, DOI. Patent descriptions, standards. RFC-s, software documents. Basics of scientometry. Citations, impact factor, Hirsch-index. 2. Online resources. Web of Science, Google Scholar. Webpages of journals and publishers. Online library catalogues. 3. Basics of scientific and technical writing. Style, good practices. 4. Genres: scientific paper, software documentation. 5. Creating a bibliography. Referencing tools and styles. 6. Oral genres: presentations, talks. 7. Practices	
Assessment methods:	Attending classes is mandatory. Missing classes is allowed three times. No medical or work certificate is accepted. Examinations are based on class content, accessible electronic sources, and course material. The students must prepare a document of 10k words on a chosen topic, with proper outline, formatting, and referencing. They should present their work in a 5-minute presentation. The grade is given based on the paper and the presentation. The students need to upload their papers and presentations to MS Teams to the dedicated assignment and have an oral exam for the presentation. The date of the exam is to be fixed during the semester.	

Operating Systems

	Semester:	Spring
Course leader: Dr. Almási Gábor	Form of teaching:	Lecture and Practice
Course requirement: Final exam	Class hours per week:	2+2
Credits (ECTS):	8	
Language of instruction:	English	
Course description:	To learn the working principles of operating systems serves as a base for understanding the concept of multi-programming, the workings and isolation of processes and the accounting and management functions of an operating system. Acquiring this knowledge is an important milestone for other subjects, like for e.g. understanding some programming paradigms, or server operations and maintenance.	
Assessment methods:	Written test Assignment to be submitted during the semester	

Computer Networks

	Semester:	Spring
Course requirement: Final exam	Form of teaching:	Lecture
Course leader: Dr. Mechler Mátyás	Class hours per week:	3+0
Credits (ECTS):	8	
Language of instruction:	English	
Course description:	1. **Introduction.** Uses of Computer Networks. Network Hardware. Network Software. 2. **Introduction.** Reference Models. Example Networks. Network Standardization. 3. **The Physical Layer.** The Theoretical Basis for Data Communication. Guided Transmission Media. Wireless Transmission. Communication Satellites. 4. **The Physical Layer.** Digital Modulation and Multiplexing. The Public Switched Telephone Network. The Mobile Telephone System. Cable Television.	

	5. **The Data Link Layer.** Data Link Layer Design Issues. Error Detection and Correction. Elementary Data Link Protocols. 6. **The Data Link Layer.** Sliding Window Protocols. Protocol Verification. Example Data Link Protocols. 7. **The Medium Access Control Sublayer.** The Channel Allocation Problem. Multiple Access Protocols. Ethernet. 8. **The Medium Access Control Sublayer.** Wireless LANs. Broadband Wireless. Bluetooth. RFID. Data Link Layer Switching. 9. **The Network Layer.** Network Layer Design Issues. Routing Algorithms. Congestion Control Algorithms. 10. **The Network Layer.** Quality of Service. Internetworking. The Network Layer in the Internet. 11. **The Transport Layer.** The Transport Service. Elements Of Transport Protocols. Congestion Control. The Internet Transport Protocols: UDP. 12. **The Transport Layer.** The Internet Transport Protocols: TCP. Performance Issues. Delay-tolerant Networking. 13. **The Application Layer.** DNS - The Domain Name System. Electronic Mail. 14. **The Application Layer.** The World Wide Web. Streaming Audio And Video. Content Delivery.
Assessment methods:	The course ends with a test-based written exam. Grading: • 90.1-100%: excellent (5) • 80.1-90%: good (4) • 65.1-80%: satisfactory (3) • 50.1-65%: pass (2) • 0-50%: fail (1)

Information and Data Security

	Semester:	Spring
Course leader: Dr. Zentai Norbert	Form of teaching:	Lecture
Course requirement: Final exam	Class hours per week:	3+0
Credits (ECTS):	8	
Language of instruction:	English	
Course description:	- General introduction in security, explaining the basics of security	

	- Attack types - Network security - Social Engineering, attacking the human factor, awareness - Physical security - IoT, mobile security, secure communication - Security frameworks and building a SOC - Hacker types, ethical hacking - Career, and roles in IT security
Assessment methods:	Evaluation systems is based on a project work where the students have to prepare a complex security proposal for a virtual company. They have to present this for the group and have to sell the solution. The evaluation makes possible to check if they are able to see security as a complex system, if they are a good presenter, and be able to work in small teams.

Operation of IT Systems

	Semester:	Spring
Course leader: Dr. Zentai Norbert	Form of teaching:	Lecture
Course requirement: Final exam	Class hours per week:	3+0
Credits (ECTS):	8	
Language of instruction:	English	
Course description:	Week 1: Types of operating systems, Virtual machines, Setting up environment Week 2: Commands and GUI Week 3: File Management, Regular expressions Week 4: User accounts, File ownerships Week 5: Scheduling Week 6: Network Configuration Week 7: Midterm exam Week 8: Firewall Week 9: File systems, RAID	

	Week 10: Remote desktop protocols, SSH Week 11: System environment Week 12: System processes Week 13: Final exam
Assessment methods:	Midterm test: 30% Final test: 40% Class assignments: 30%

Control Technology

	Semester:	Spring
Course leader: Dr. Zentai Norbert	Form of teaching:	Lecture and practice
Course requirement: Final exam	Class hours per week:	2+2
Credits (ECTS):	8	
Language of instruction:	English	
Course description:	**Week 1:** The concept of control, its components, and classification. The chain of control and regulation. An example of computer-controlled systems for controlling, regulating, and programming microprocessors. Practical introduction and demonstration of lab usage. **Week 2:** Motion control: deterministic approach, statistical approach, and their modeling. **Week 3:** Direct kinematics problem, control of the motion of multi-degree-of-freedom robotic arms. **Week 4:** Inverse kinematics problem. Optimization conditions for solving and controlling motion tasks of multi-degree-of-freedom (multi-joint) robotic arms. **Week 5:** Introduction to Raspberry Pi development environments. Setting up the devices. **Week 6:** Basics of programming the BotBorduino robotic arm. Understanding the hardware structure and outlining the possibilities/frameworks. **Week 7:** Overview of Arduino development environments. Familiarization with the development environment and implementation of basic algorithms. **Week 8:** Sensor-actuator transformations and their practical applications. **Week 9:** Measurement, processing, and noise filtering of electrical and kinematic signals for practical control tasks. **Week 10:** Application of electrical and kinematic signals and time series in the control of physical devices' movements.	

	Week 11: Presentation and implementation of algorithms controlling various structures in microcontrollers. **Week 12:** Human-machine interaction (brain-machine, body-machine).**Week 13:** Evaluation of the semester, conclusion, and summary review.
Assessment methods:	Assignment to be submitted in Matlab Lab report